PLDT Network Transformation Journey

to Support the Digital evolution and Modernization of cities and citizen services using IoT.

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PLDT VISION

PLDT's goal is to build a connected future where everyone can flourish.
The telecommunications industry is experiencing enormous growth; with network traffic growing faster than any other period and digital technology changing the world we live in. The challenge of Covid-19 pandemic has also completely revolutionized the dynamics of services required for citizens.

PLDT's vision is to focus and align the path for next generation technologies to build a network which can serve requirements to modernize cities and bring digital services and connected solutions that create next-generation experiences to everyone.

- ***The Opportunity to Reshape Cities with Mobility networks***
- ***Self-Driving Stories: How Cities can Move Towards Introducing Autonomous Vehicles***
- ***How the IOT Will Reshape the Citizen Experience***
- ***Citizen Engagement and Public Service in the Era of IOT***

What is the Internet of Things?

The term "things" refers to various technological gadgets that share data and connect to an application. This term can also be used to denote a device with measuring capabilities or a device with an output capability. When these gadgets are connected to a data-exchanging application, the system is referred to as a "connected thing" or "device." As these systems of connected things connect to form a network, the Internet of Things emerges.

In general, at a very high level, the "Internet of Things" is a collection of devices and sensors that exchange data across applications and other connected devices over the Internet.

IoT then enables us to leverage machine generated data to produce both business and consumer benefits.

Let's demystify IoT

Consumers believe IoT is about home-based solutions like smart speakers, locks, lamps, and setup boxes, while others in enterprises think IoT is equal to smart cities. The understanding could be very different, but the reality is that it cuts across both consumer and enterprise in digital world.

While many people think that IoT is used only in businesses and workplaces, we have already been using some forms of IoT-based solutions even in our homes, such as smart appliances, security systems and thermostats.However, we do encounter those devices at our workplaces, stores, gas stations, and other businesses, industrial, retail, or workshop environments.

The consumer impact of IoT?

IoT is rapidly becoming one of the most common technologies of the current era. The continuously increasing adoption of IoT has made sensors inexpensive and easy to embed or integrate into our daily use, both at home and outside. IoT sensors and applications are deployed in public settings, workplaces, various industries, roadways and buildings in ways that the consumer doesn't have to consciously interact with them. In many or most cases, consumers are not even aware of their use or deployment.

These IoT solutions improve the consumer experience, such as lighting up the roadways at night, building environment monitoring and management, industrial safety systems, preventive maintenance, traffic control, surveillance and security, inventory management, retail goods replenishments, etc. Other uses include improving irrigation of vegetation and farmlands to deliver better yields and quality, while minimizing water loss and waste. More often than not, the consumer may not even know about how and where IoT was deployed throughout the value chain supporting their daily experiences.

So why is IoT so important?

Okay, let's talk about why the Internet of Things is so important.

IoT has made capabilities possible in ways that could never be imagined before. Applications that read and analyze the data from these devices and sensors can be programmed for specific behaviors and actions that directly or indirectly affect the user of those devices. They can operate with minimal human intervention.

The Internet of Things is enabling improved resource utilization and reduction of waste, while improving experiences and influencing changes in behavior. It is driving cost optimization, opening up incremental revenue opportunities, increasing productivity levels, and extending life of assets. It is enabling us to give more attention to sustainability and improving quality of life for human beings.

Think about what's going on: there has always been a gap between the physical world and the digital world, and now that gap is being bridged. That's what the Internet of Things has made possible. The physical world is now connected to the digital world, and through the use of these devices and applications, they are now working together and cooperating. IoT is transforming the nature of the way how things are made, the way people live, how people behave, and so many other aspects of consumer actions and behaviors.

How does this translate to the enterprise?

Enterprises have recognized the impact of IoT on their business processes and are quickly adopting the Internet of Things as an integral component of their enterprise architecture and infrastructure. By incorporating IoT solutions and features, business processes are being transformed by becoming more efficient, less error-prone from human errors, and increasing automation.

IoT is creating value for industries by optimizing utilization of resources, reducing downtimes, and extending life of capital assets. Utilities are reducing waste by monitoring and improving consumption of resources like water, electricity and gas.

IoT then enables us to leverage machine generated data to produce both business and consumer benefits.

Nearly every industry has recognized the value of IoT, be it manufacturing, utilities, energy, healthcare, financial, retail, transportation, or pharmaceuticals! IoT-enabled solutions are enabling the enterprise to transform business processes with more digitally enabled capabilities, while identifying and creating more opportunities for technology-enabled transformations across entire value chains, leading to improve customer experience.

The journey of IOT adoption by enterprise can be made smooth with timely managing and working on few important considerations like:

- ***Build capabilities to connect all of the data and effectively process it***
- ***Deal properly with security and data privacy threats***
- ***Follow common technology standards for better communication***

Asset connectivity also plays a vital role in the IOT adoption journey. Connecting assets isn't easy. There are many use cases for which you need connectivity - whether it is connecting service fleets, video surveillance cameras, remote assets.

Every use case has different requirements - access technologies, protocol interoperability, form factor, compliance requirements, environmental and mounting options vary.

Asset connectivity is critically important in industrial sites especially around mining locations, ports, and manufacturing facilities. This not only helps the operations and monitoring, but likewise safeguards and maximizes the investments out into these assets.

Below are a few more benefits which can be derived by enterprise from the operational assets:

- ***Improve operational efficiency***
- ***Reduce maintenance costs***
- ***Maintain business continuity***
- ***Enhanced insights for business making decisions***

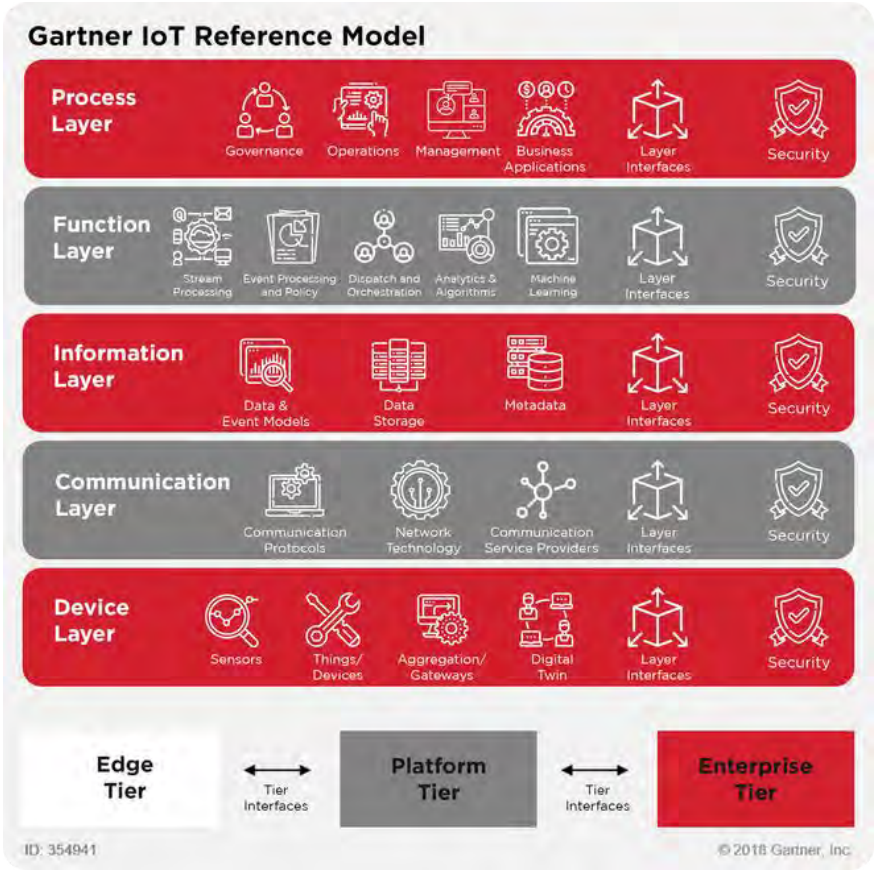
We will also need standardisation on data and asset connectivity to deliver right business outcome and PLDT as an operator will drive this with IOT reference model as base framework.

IOT Reference model

Main contributors in building the IOT ecosystem will be device & sensors manufacturers, connectivity providers, cloud service providers and application hosting partners. This ecosystem will need a common grounding and language to develop right IOT architectures with business outcomes. PLDT vision is to take lead in bringing all contributors under same ceiling to follow the IOT reference model for data communication and processing.

This image shows the reference model with different layers, and the same can be referred to as base framework for building IOT architectures.

On a high level, this model has five layers, beginning with devices/sensors as the base layer, with well-defined interfaces and communication protocols to push data to the processing layer.



What are use cases, and why are they important?

A specific use of an IoT-enabled solution is commonly referred to as a Use Case. In other words, a use case is a description of how a user interacts with a system or process to achieve an outcome.

For example, think of a light that is activated via a motion sensor. That is an example of a “smart light” use case, and the user of that light is activating the light via motion. A “smart parking” example is where a driver of a vehicle may use an application to reserve a parking location.

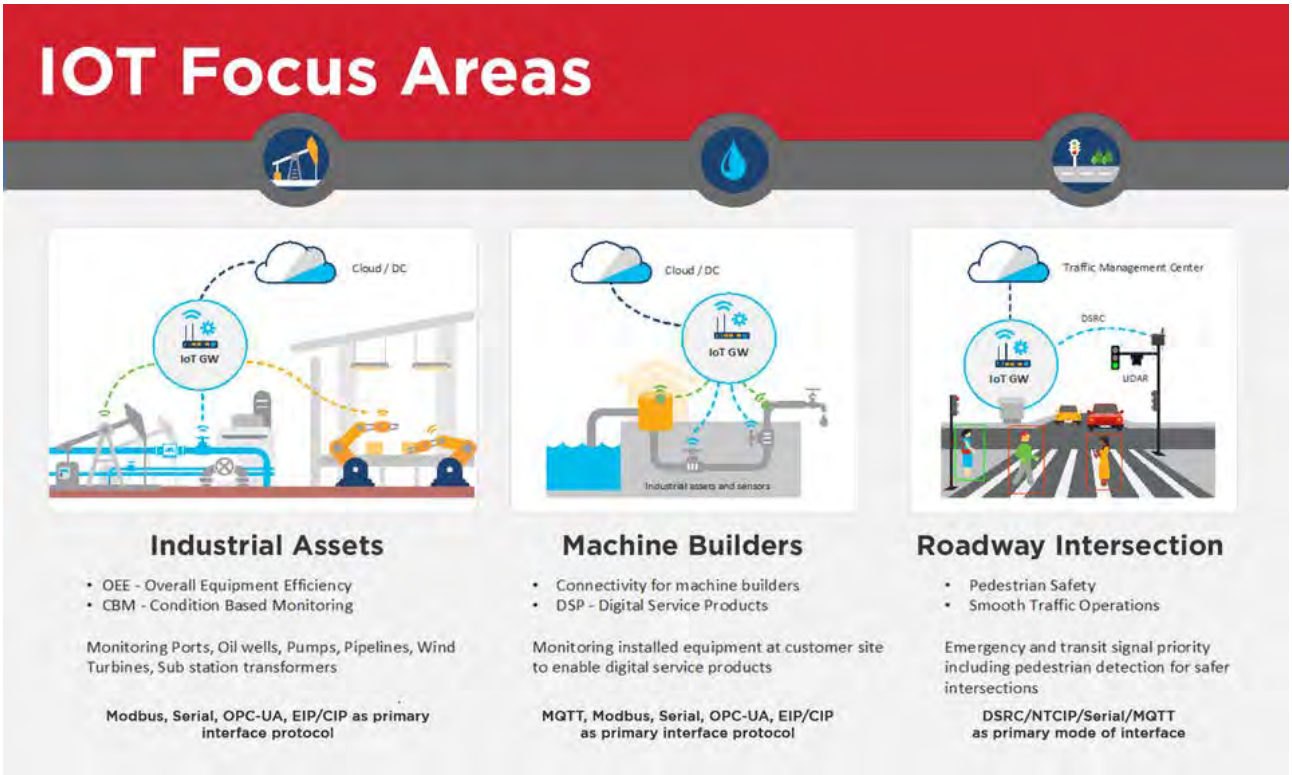
While these are examples of specific systems or applications, a use case can also describe a broader application of systems and/or applications, such as Smart Cities, which is a broad “use case” that may be a combination of multiple specific use cases.

IOT enables transformative use cases in the industry, and the connectivity of the Internet of Things promises radical transformation across industries such as manufacturing, oil and gas, transportation, city and local government, utilities, and mining. Connecting disparate systems or even new places that have never been connected are yielding amazing results with IOT

Today, data governs all aspects of business decision-making, helping to improve operation efficiencies and productivity across the organization. By collecting data from connected assets organizations can, for example:

- ***Improve safety by monitoring assets***
- ***Digitize inventory control and connect operations to streamline operations***
- ***Improve productivity quality by reducing errors due to automation, or even***
- ***Workplace enablement: Bringing connectivity to enable workers to access data or the internet in different locations.***

IoT architecture helps in a variety of vertical markets around the world. Currently, IOT major focus is on manufacturing, utilities, transport/logistics, energy as well, mining, and public sector. Within each of these vertical markets, there is a number of interesting segments, each with their own buyer personas and care abouts. Many use cases are listed here under each vertical as shown below.



The use cases can be applied to different industries depending upon the movements and trends in the various sectors. For example, in the oil and gas market, you have individual buyer needs between upstream and downstream segments. Within each of these focus areas, vendors have validated designs and best practices to help develop services and solutions for customers.

General Communities Trends

Let's talk about the trends in communities.

Effects of urbanization: By 2050 70% of worldwide population will be in cities, driving a need to secure adequate housing and infrastructure for growing populations.

Sustainability: Between 60-80% of worldwide energy consumption and greenhouse gas emissions are in cities, creating a need to ensure affordable, reliable, and modern energy for all.

Public Safety: Nearly 8 in 10 children in 80+ countries have been subjected to psychological or physical violence, highlighting a need to promote rule of law, safety, and justice.

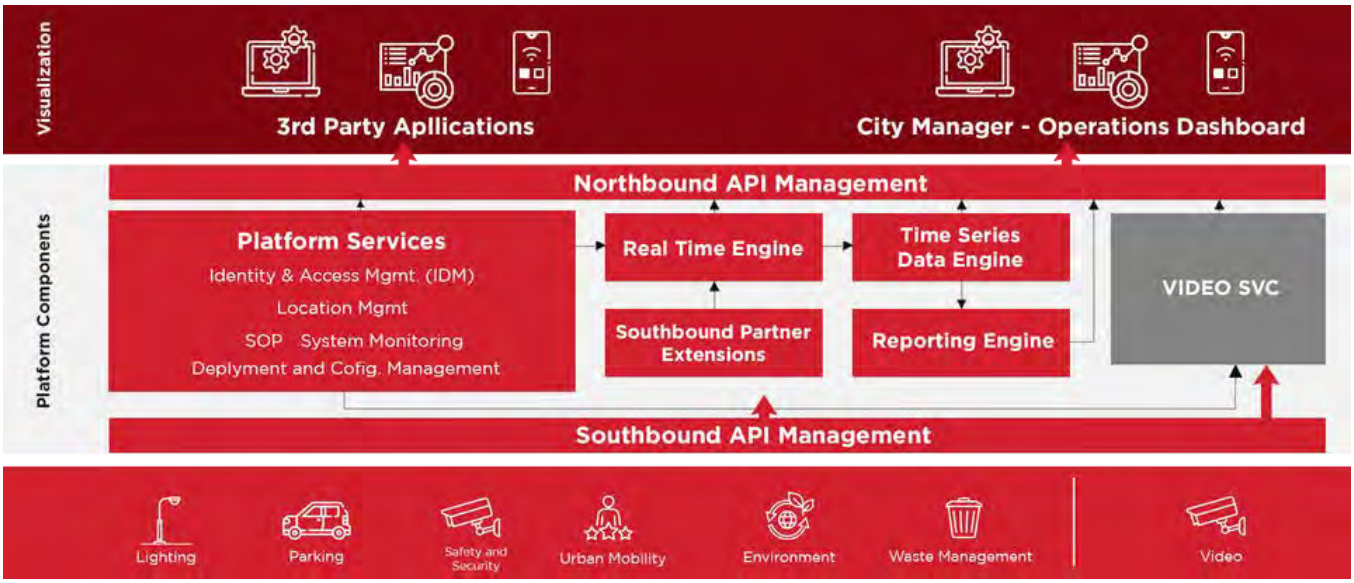
Shifting economics: Aging populations in leading economies and booming population in emerging economies, thereby highlighting the need to foster sustainable and inclusive economic growth.

These trends can have an impact on the priorities of various industries and even influence other industries.

Aside from the environmental trend, there is a quiet a development, such as emerging technologies that can be used to create next generation experiences. Let's paint a holistic view of the city with different services requirements for the citizen and how the emerging technologies will fit to accommodate or facilitate those needs.

The above image illustrates that citizen services which needs digitization for improving customer experience are environment monitoring, transportation, traffic and roadways control etc. All the above services once automated with the help of underlying technologies, as mentioned in the last section of image, are managed and operated from centralized data centers with data sources from end devices in the form of camera feed and sensors feed up to the city operations dashboard. Underlying technology is a mix of IOT at access and backhaul connectivity.

A typical view, how data will flow from end device to central dashboard along with processing for building business outcome is shown below.



Role of IOT

The connectivity of the Internet of Things promises radical transformation across industries - manufacturing, energy as well, transport/logistics, utilities, mining, and public sector.

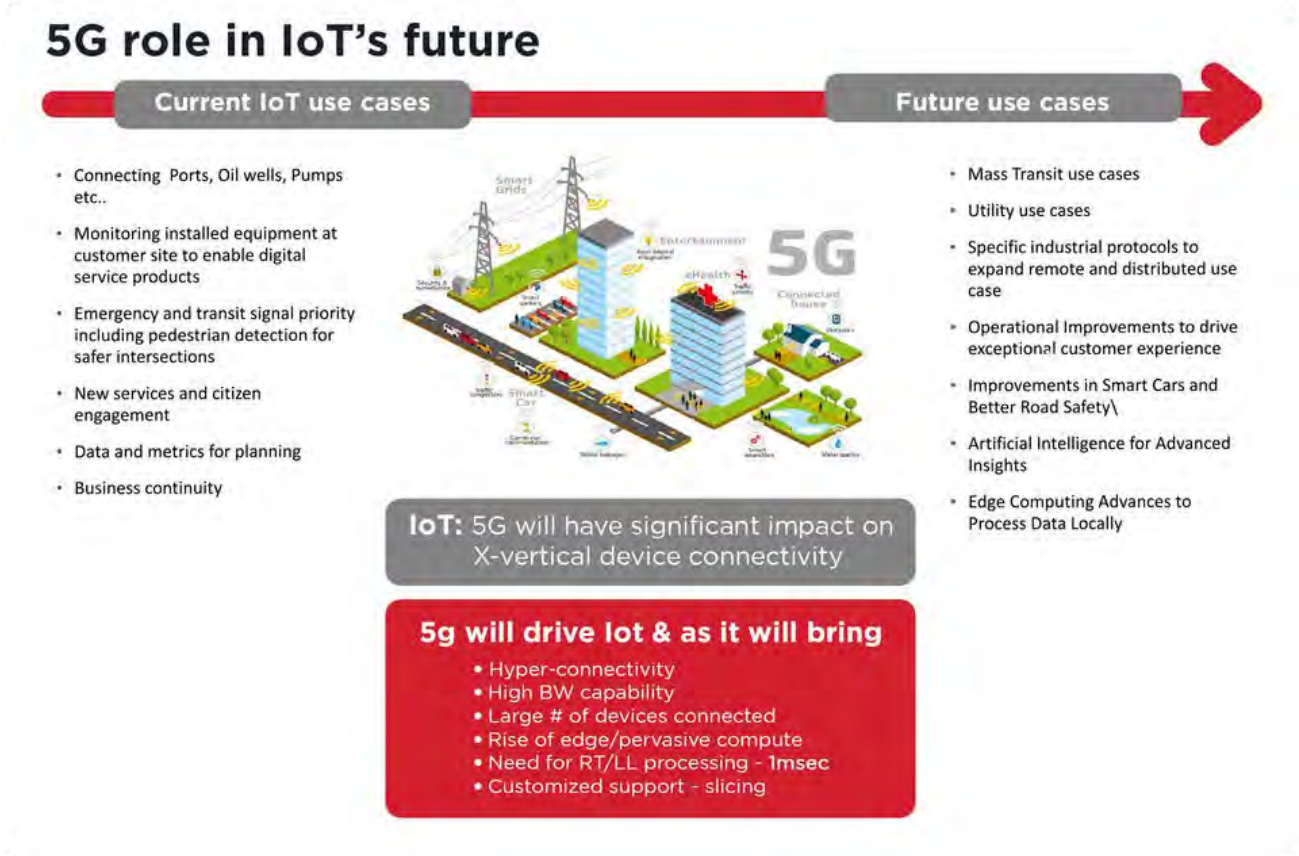
Cities are reducing traffic by reporting real time road conditions. We're improving worker safety in oil & gas refineries with telemetry and sensors on wireless networks, improving predictive maintenance of machines in manufacturing environments to improve uptime, and reducing the need for guys with clip boards to monitor fluid level in storage tanks.

Every one of these is an example of the outcomes, not the singular products.

IoT is now being used by businesses to transform agriculture, optimize fleet management, improve warehouse management, and improve healthcare outcomes. Also among many other things, we can expect to see IoT use cases increase, providing a foundation to support many core business activities across industries.

5G is one of the components of the Fourth industrial revolution, that will play a vital role in IOT use cases expansions. It will help drive innovations in various industry domains and will expand IOT to new horizon.

As highlighted in below image, 5G will have significant impact on device connectivity and 5G technology will transform the types of use cases supported in the future by IOT bringing in high bandwidth, dense connectivity, and reduced response time.



Both emerging technologies and environmental trends, as described in this document, will drive the deployment and adoption of IOT solutions for communities, thereby accelerating country digitisation and the economy. The PLDT vision of building next-generation networks will foster a healthy ecosystem of OEMs and service providers, laying the groundwork for appropriate standards and facilitating IOT adoption by enterprise.

Cisco is completely dedicated to working with PLDT on 5G technology integration for IoT. Cisco will jointly review for qualifications of opportunities for proof of concepts, focusing on multiaccess technologies as successful integration will represent a mix of use cases and topologies.

PLDT Enterprise is a leading Service Provider as a Channel and Managed Services partner of Cisco. This partnership aims make IT a platform for agility that will help customers pivot on demand. This stays true with the mission of delivering customer solutions around four key pillars: Reimagine Applications, Empower Teams, Transform Infrastructure and Secure Data. As partners, they jointly focus their efforts on meeting customers where they are in their transformation by doing foundational things better than everyone else. With customers in mind, PLDT Enterprise and Cisco work together to:

- ***Deliver value immediately and consistently,***
- ***Empower buyer preferences for rapidly deployable technology like SaaS and as-a-service solutions***
- ***Leverage managed services to help customers realize value faster.***
- ***These allow them time to focus on new strategic initiatives that will drive further outcomes for their organization.***

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